

Oxygen-Independent Pressure Sensitive Paint, Phase II

Completed Technology Project (2015 - 2017)



Project Introduction

Pressure sensitive paint (PSP) systems are excellent tools for performing global pressure measurements in aerodynamic testing, especially in wind tunnel studies. The major limitation of PSP for pressure mapping is its dependence on an oxygen-containing flow, since those paints are actually oxygen sensors. Intelligent Optical Systems (IOS) is developing a unique coating in which fluorescence quenching can form high resolution images of the true pressure distribution on surfaces in transonic flow in oxygen-free atmospheres. The fluorescence in these unique coatings depends directly on absolute pressure, and oxygen permeation into the coatings is not required. The new coating, however, is completely compatible with the "legacy" (oxygen sensing) visualization equipment used in current transonic test facilities. With this novel pressure sensing technology, coating materials can be used that are not useful for oxygen-based PSPs, and coatings that can meet requirements not achievable with classical paints, like operation at extremely low temperature or in highly contaminated environments. In Phase I, IOS has created the oxygen-insensitive pressure-sensitive coating materials, and applied them to glass and stainless steel test coupons. The fluorescence emission lifetime and intensity of these test samples were measured at varying static pressures under pure nitrogen, showing significant correlation with pressure in the range studied (from 0.05 to 14.7 psi), and excellent repeatability. This sets the stage for Phase II development and delivery of a complete temperature-compensated true ambient pressure sensitive paint system that can be used to characterize flow around structures in hypersonic wind tunnels. At the end of Phase II, the coatings will have been tested at relevant environments (TRL5), and will be available for NASA to begin testing in a high-fidelity laboratory environment (TRL6).



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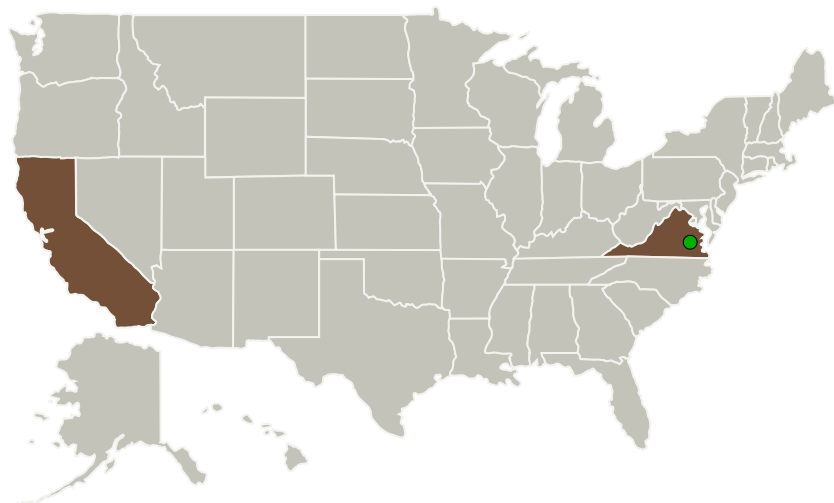
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Intelligent Optical Systems, Inc.	Lead Organization	Industry	Torrance, California
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

California	Virginia
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Intelligent Optical Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jesus D Alonso

Co-Investigator:

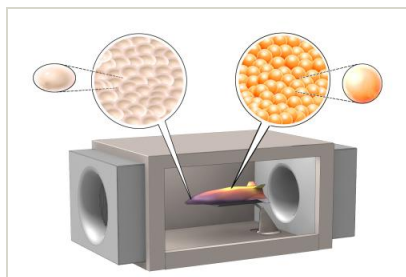
Jesus Delgado Alonso

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Images

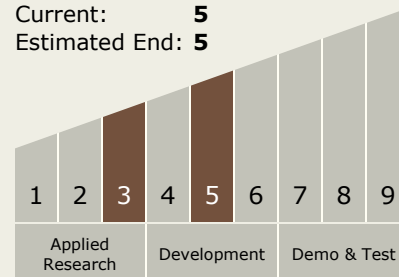


Briefing Chart

Oxygen-Independent Pressure Sensitive Paint Briefing Chart
(<https://techport.nasa.gov/image/130990>)

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.8 Ground and Flight Test Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System